

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: ALLEN, Mark R.

Group Art Unit: 2821

Serial No. 09/339,616

Examiner: Vo

Filed: June 24, 1999

Title: Improved Embodiment to LED Light String



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**REPLY BRIEF UNDER 37 C.F.R. 1.193**

Assistant Commissioner for  
Patents and Trademarks  
Washington, D.C. 20231

October 27, 2002

Sir:

In response to the Examiner's Answer mailed August 27, 2002, please enter the following Reply Brief in accordance with 36 C.F.R. 1.193.

Prior to Appellant's invention, LEDs were only rated for DC voltage. Appellant discovered that determining an equivalent AC rating for each LED permits a balancing of LED circuitry forming a string of lights. The prior art devices were unstable because the DC rating for LEDs did not match the AC circuitry of a standard 120V AC outlet; therefore, the prior art LED light string required an AC/DC converter, current reduction transformer, or some form of resistor circuitry connected between the light string and the household VAC to operate successfully on a long term continuous basis.

Independent claim 1 recites a formula based on the AC rating for a series of LEDs. Based on an LED's AC rating, this invention permits the use of a series of LEDs in a string of lights without the need for additional circuitry.

On this point alone, the Examiner's argument must fail because the prior art fails to teach or suggest the use of AC voltage ratings for LEDs. Thus, the prior art requires

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and teaches the use of additional circuitry, i.e., a resistor or other power-limiting elements. The prior art teaches away from the claimed invention because it is based on DC ratings for the LEDs and, thus, the prior art suggests that intervening circuitry is required to provide a stable circuit.

The invention recited in claim 1 is directed to a light string comprised of LEDs adapted to be connected directly to household type VAC (alternating current voltage source) via household plug 101 notwithstanding the fact that the light string is comprised of LEDs 102 that are rated to operate on DC (direct current). The number of LEDs is determined according to the formula of dividing the nominal VAC voltage, i.e., 110 or 220 VAC, by the average AC drive voltage (not the DC drive voltage) of the LEDs. Owing to this configuration, the unexpected result is that the LED light string requires neither an AC/DC converter, current reduction transformer, or any form of resistor circuitry connected between the light string and the household VAC to operate successfully on a long term continuous basis.

In this Appeal, all rejections are based, at least in part, on US Patent No. 5,941,626 to Yamuro. Fig. 1B of Yamuro is reprinted below.

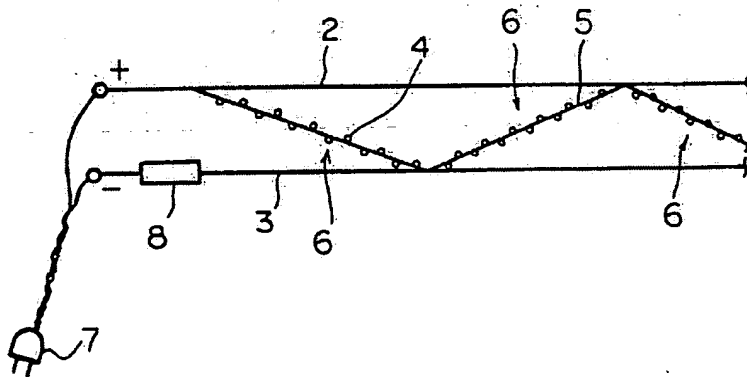


Fig. 1B of Yamuro shows a series block of LEDs connected, via resistor (8), to a pair of source wires for AC power supply 9 through plug 7. The Examiner asserts this is a

“direct” connection of the LED string to the power source inasmuch as the resistor 8 simply forms an electrical conducting function. Alternatively, even if the resistor does not imply a “direct” connection, the resistor can be removed and then a “direct” connection would exist as it does in the present claims. (See Section 2 of Final Rejection and Examiner’s Answer for full statement of rejection.)

The basis of the invention, i.e., the direct connection of an AC source to a block of series connected LEDs, is set forth in the language of claim 1 in three separate phrases. Applicant has reproduced claim 1 below with the critical phrases shown in **bold**.

Claim 1 on appeal

1. A light string comprising:

a predetermined number of light emitting diodes “LEDs” electrically coupled in series to form at least one series block, each LED having an average alternating current drive voltage, the series block having a first LED and a last LED, **the first LED directly coupled intermediate a source end and a terminal end of a first of a pair of wires** and the last LED directly coupled intermediate the source end and the terminal end of a second of the pair of wires, **the light string being free from additional circuitry intermediate the first LED and the source end of the first pair of wires, between each of the LEDs, and intermediate the last LED and the source end of the second pair of wires, and**

**a first connector coupled to both the source end of the first of the pair of wires and the source end of the second of the pair of wires which connector facilitates a direct connection between the first LED and a first side of an alternating current electrical power supply, and the last LED and a second side of the alternating current electrical power supply, the supply having a supply voltage, the predetermined number of LEDs substantially calculated by dividing the supply voltage by the average alternating current drive voltage.**

The Examiner has chosen to ignore clear and unambiguous language of the claims, as evidence by the Examiner’s primary argument reprinted below. According to the Examiner,

“The fundamental difference between the views of the appellant and of the examiner evolves from the disagreement with respect to the understanding of a ‘direct’ electrical connection. In particular, the appellant insists upon interpreting ‘direct’ electrical connection such as recited in several places of claim 1 to be free of any

intervening electrical elements; whereas to the examiner, this is nothing more than any form of electrical conduction between two adjoining points. In the examiner's view, a 'direct' connection between two adjoining points may optionally include electrical elements that ultimately permit passing of electrical current." See Examiner's Answer, page 8, first paragraph under heading "Response to Argument with respect to 1<sup>st</sup> Rejection".

The Examiner has mis-interpreted the phrases "directly coupled" and "direct connection" of claim 1 to include an arrangement where additional circuitry (i.e., a resistor) may optionally be provided despite the fact that claim 1 specifically states that the light string is "*free from additional circuitry* intermediate the first LED and the source end of the first pair of wires, between each of the LEDs, and intermediate the last LED and the source end of the second pair of wires". Emphasis added by appellant.

In anticipation, perhaps, that the first recitation of the Yamuro based rejection under 103 is not well founded in light of the claim language precluding the resistor, the Examiner recites an alternative rejection under 103, also relying on Yamuro, but in this version of the rejection eliminating the resistor in Yamuro and declaring the resistor "optional".

Appellant maintains that Yamuro considered as a whole does not teach or suggest elimination of the resistor. Yamuro at col. 3, lines 34-41 sets forth the necessity of the resistor 8 in the Yamuro light string, stating

"... the resistance 8 apparently seems unnecessary. However, it is proved from experience that the apparatus is stable in function by providing the resistance 8. Therefore, the resistance 8 is connected to the circuit as shown..."

This is no small assertion in the language of Yamuro. Yamuro requires the resistance 8 because Yamuro fails to recognize that the predetermined number of LEDs substantially is calculated by dividing the supply voltage by the average alternating current (AC) drive voltage. Indeed, the notion that a resistor is necessary is the state-of-

the-art in LED use and is bolstered by the experimental results conducted and documented in the M. Allen, Decl., ¶ 13-33, et seq., and particularly ¶34, where the results of experiments are presented in tabular form. Notably, the statement from Yamuro that, “it is proved from experience”, that the resistance is necessary rings true. None of the circuits that eliminated the resistor worked for a period longer than it took for the LEDs in the light strings to rapidly and successively fail. In addition, the LED art is replete with the teaching that the resistor is as set forth in Yamuro is a necessity. (See M. Allen Decl., ¶ 5-9, 11-12, and attached Exhibits B-F thereto).

Lastly but significantly, claim 1 recites a formula for determining the number of LEDs to be used in a block series of LEDs for an LED light string to embody the present invention. Specifically, the formula is directed to using the average alternating drive current (AC) of the LEDs to be used and dividing this number into the supply voltage. The claimed calculation reveals the total number of LEDs to be series connected in each block. Inasmuch as Yamuro does not concern itself with AC ratings for LEDs at all, there is no disclosure of this formula. The Examiner, however, asserts that a person of ordinary skill, when confronted with producing a Yamuro circuit for a given voltage would unavoidably derive this formula from routine design necessity. This assertion by the Examiner is refuted by Yamuro’s own language and suggested practice. In fact, routine design by Yamuro would be based on a DC rating not on an AC rating for the LEDs; therefore, the person of ordinary skill would never arrive at the claimed invention.

In col.7, lines 17-end, the circumstance is described in Yamuro where a 24V power supply is used in conjunction with the described LED invention. Notably, even though 2V LEDs are used, Yamuro does not use 12 LEDs as suggested by the

Examiner's "unavoidable" consequence theory, instead the Yamuro solution is to specify 10 LEDs to be used in conjunction with a 4V voltage drop resistance 32 also connected into the circuit. (Note the presence of the resistor in conjunction with the LED string!) Hence a solution is derived in Yamuro for exactly the circumstance the Examiner describes, but the solution is entirely different than what is proposed as "unavoidable" by the Examiner. Yamuro again, in fact, teaches away from what is suggested by the examiner.

Conventionally, LEDs are rated for direct current (DC) applications. Appellant provides the first LED light string designed according to the formula using the average alternating drive current (AC) of the LEDs to be used and dividing this number into the supply voltage, the calculation revealing the total number of LEDs to be series connected in each block. For this reason, the claims are patentable.

**Secondary Considerations:**

Secondary considerations must be given due weight by the examiner and Board of Appeals during ex parte prosecution. *In re Sernaker*, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983). Here, the Examiner dismisses Appellant's evidence out of hand and improperly concludes that, "commercial success which appellant may have enjoyed does not alter the fact that the invention is an obvious design of Yamuro." See Examiner's Answer, page 10, last paragraph.

Appellant created an entire market for LED light strings – a market that did not exist prior to Appellant's invention. Appellant has provided evidence of millions of dollars worth of sales within weeks of obtaining UL approval. D. Allen Decl., ¶¶11-13.

Appellant has also provided evidence of copying by others who learned about the invention from Appellant. D. Allen Decl., ¶¶14-20.

The Examiner fails to point to any evidence to rebut these secondary considerations. In addition, the Examiner incorrectly states that Yamuro offers the suggestion of making the same lighting system “in country where power distribution can be done in a stable manner.” Examiner’s Answer, page 10, last paragraph. To the contrary, Yamuro states that “it is proved from experience that the apparatus is stable in function by providing the resistance 8.” Yamuro, col. 3, lines 37-38. Yamuro never mentions stable power distribution; instead, Yamuro states that intervening circuitry is required for stability.

Lastly, the Examiner states that “Demonstrating potential interest of others does not constitute **absolute proof** of appellant’s break through.” Examiner’s Answer, page 11, first sentence, emphasis added. Appellant has offered actual interest and success not “potential” interest.

More importantly, absolute proof of non-obviousness is not required. Indeed, the “ultimate determination of patentability is based on the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and secondary considerations.” MPEP 2142, citing, *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). Therefore, the Examiner has applied the wrong standard in the obviousness determination.

Commercial success and copying by others may rebut a finding of obviousness. *Hybritech Inc. v. Monoclonal Antibodies*, 802 F.2d 1367, 1380, 231 USPQ 81, 90 (Fed. Cir. 1986). Here, the balance of evidence favors a finding of non-obviousness. The

Declaration of David Allen shows millions of dollars in sales directly attributable to the claimed invention with little or no advertisement. See D. Allen Decl., ¶ 12. The immediate and widespread copying of the claimed invention following the introduction of the technology further rebuts the 103 rejections. D. Allen Decl., ¶¶ 14-22. At least one of the copiers alleged that it was not possible to construct an LED light set without current limiting circuitry – until they learned about this invention. See D. Allen Decl., ¶ 18.


The commercial success of the claimed invention rebuts any prima facie 103 rejections.

#### Conclusion

The Yamuro reference lacks sufficient disclosure to support the Examiner's assertions and, taken as a whole, the Yamuro reference teaches away from Applicant's claimed invention. In addition, Applicant has submitted rebuttal documentary and declarative evidence against the Examiner's assertions that also outweigh the 103 based rejections. As such, the Examiner's rejections should be reversed and such a decision by the Board is respectfully sought.

Respectfully submitted,  
Liniak, Berenato, Longacre & White

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